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REMARKS

Claims 1-23 are pending in the present Application. No claims have been cancelled, amended, or added, leaving Claims 1-23 for consideration upon entry of the present Amendment. No new matter has been introduced.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejection Under 35 U.S.C. § 102(a or e)

Claims 1-4, 9, 10, 19, and 20 stand rejected under 35 U.S.C. § 102(a or e) as allegedly anticipated by US Patent Publication No. 2004/0038251 to Smalley et al. (hereinafter "Smalley"). The Applicant respectfully traverses this rejection.

Independent Claim 1 is directed to a method of separating *met*-SWNTs from *sem*-SWNTs comprising suspending a population of functionalized SWNTs in a suspending solvent, and employing a means for inducing selective precipitation, wherein selective precipitation comprises precipitating a majority of the *met*-SWNTs while leaving a population of the *sem*-SWNTs in suspension, or precipitating a majority of the *sem*-SWNTs while leaving a population of the *met*-SWNTs in suspension.

Independent Claim 19 is directed to a method of separating *sem*-SWNTs or *met*-SWNTs by diameter to form a diameter-separated population of *sem*-SWNTs or *met* SWNTs, comprising suspending an enriched population of functionalized *sem*-SWNTs or an enriched population functionalized *met*-SWNTs in a suspending solvent to form a functionalized *sem*-SWNT suspension or a functionalized *met*-SWNT suspension, and employing a means for selectively precipitating according to diameter the functionalized *sem*-SWNTs or functionalized *met*-SWNTs, wherein the enriched population of functionalized *sem*-SWNTs comprises greater than or equal to about 66 wt% *sem*-SWNTs or the enriched population of functionalized *met*-SWNTs comprises greater than or equal to about 66 wt% *met*-SWNTs.

Smalley is generally directed to a method of sorting and separating mixtures of single wall carbon nanotubes (SWNTs) by type (e.g., diameter and/or conformation).

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To anticipate a claim, a reference must disclose each and every element of the claim. *Lewmar Marine v. Variant Inc.*, 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987). The Applicant contends that Smalley does not anticipate independent Claims 1 and 19 because Smalley fails to disclose at least the feature of selective precipitation. Smalley discloses "sorting and separating carbon nanotubes by diameter and chirality type based upon their electronic and optical properties by dispersing the nanotubes, imparting a charge to a selective fraction of the nanotubes, and separating the nanotubes based on the nanotubes' net charge. The amount of charge that the nanotube can accommodate is a function of its electronic structure, diameter and conformation.", (Smalley, page 4, paragraph [0052], emphasis added). This is markedly different from selective precipitation or separation based on the solubilities of the nanotubes.

The Applicant, after thoroughly studying Smalley, cannot find any disclosure of the selective precipitation of carbon nanotubes by type. The Examiner has cited paragraphs [0019] through [0024] as evidence of Smalley's disclosure of selective precipitation. Because paragraphs [0023] and [0024] relate only to applications for already separated nanotubes, the Examiner's attention is respectfully directed only to paragraphs [0019] through [0022] of Smalley's specification, which have been reproduced in their entirety for convenience as shown below.

> This invention relates to a method for sorting and separating carbon nanotubes, and in particular single-wall carbon nanotubes, by diameter and conformation, based upon the electronic and optical properties of the nanotubes. The invention also relates to compositions of selected nanotube types and sensing devices comprising them.
>
> In one embodiment of the invention, single-wall carbon nanotubes are dispersed in a fluid, such that a certain fraction of the nanotubes have a net charge, and subjected to separation in an electric field. The single-wall carbon nanotubes migrate through the media under the influence of the electric field at a rate dependent on net charge, structure and chirality of the single-wall carbon nanotube. The nanotubes of different structure and chirality move at different rates, elute at different times, and are collected.
>
> In another embodiment of the invention, single-wall carbon nanotubes are dispersed in a fluid, wherein the pH of the fluid is adjusted so as to cause a certain fraction of single-wall carbon nanotubes carry a net electric charge. The charge carried by each nanotube depends on its individual structure and chirality. The nanotube dispersion is then subjected to chromatographic separation in an electric field wherein the single-wall carbon nanotubes migrate through the fluid under the influence of the electric field at a rate dependent on their structure and chirality. The nanotubes of different structure and chirality elute at different times and are collected.

> In yet another embodiment of the invention, single-wall carbon nanotubes are dispersed in an aqueous system wherein the nanotubes are surrounded by a generally non-perturbing coating, such as a micellular arrangement of surfactant molecules. A mixture comprising the nanotubes and the coating precursor, such as the surfactant, is vigorously agitated in order to coat individual nanotubes, which are subsequently separated from metallic catalyst residues and other carbon forms, such as nanotube ropes and amorphous carbon. The pH of the individually-dispersed nanotube suspension is made basic and then acidified to approximately neutral pH so as to protonate a first fraction of single-wall carbon nanotubes. **The nanotube dispersion is then subjected to electrophoretic separation wherein the protonated single- wall carbon nanotubes migrate on a medium or diffuse through a fluid under the influence of an electric field at a rate dependent on the structure and chirality of the single-wall carbon nanotube.** The nanotubes of different structure and chirality elute at different times and are collected. The steps of acidifying the remaining non-protonated portion of the nanotube mixture and electrophoretically the nanotubes are repeated step-wise until the entire population of nanotubes has been protonated and separated according to conformation and structure. Note the term "conformation" shall include all aspects of chirality or lack thereof. The term "structure" shall include all aspects of dimension, such as diameter and length.
>
> (Smalley, page 3, paragraphs [0019] through [0022], emphasis added)

As described by Smalley, the nanotubes are separated from one another by migrating under the influence of an electric field at different rates based on their net charge, which itself is dependent on the structure and chirality of the nanotubes. This is NOT the same as selective precipitation based on differences in solubilities of different types of nanotubes.

In view of the foregoing, the Applicant respectfully requests withdrawal of the rejection of Claims 1-4, 9, 10, 19, and 20.

Claim Rejection Under 35 U.S.C. § 103(a)

Claims 5-8 and 11-18 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Smalley in view of US Patent No. 6,187,823 to Haddon et al. (hereinafter "Haddon"). The Applicant respectfully traverses this rejection.

Claims 5-8 and 11-13 depend from, and ultimately include all of the features of, Claim 1. Claim 1 is directed to a method of separating *met*-SWNTs from *sem*-SWNTs comprising suspending a population of functionalized SWNTs in a suspending solvent, and employing a means for inducing selective precipitation, wherein selective precipitation comprises precipitating a majority of the *met*-

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SWNTs while leaving a population of the *sem*-SWNTs in suspension, or precipitating a majority of the *sem*-SWNTs while leaving a population of the *met*-SWNTs in suspension.

Independent Claim 14 is directed to a method for selective extraction of *sem*-SWNTs from a mixture of *sem*-SWNTs and *met*-SWNTs, comprising contacting a population of non-acid functionalized SWNTs with an surfactant amine, to form a population of surfactant amine functionalized *sem*-SWNTs and extracting the population of surfactant amine functionalized *sem*-SWNTS with a means for solvent extraction while leaving a majority of the *met*-SWNT behind.

Smalley is discussed above.

Haddon is directed to methods for solubilizing single walled carbon nanotubes (SWNTs).

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceutical Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

The Applicant asserts that a *prima facie* case of obviousness has not been established because the cited references fail to teach or suggest all elements of Applicant's independent Claims 1 and 14.

Specifically, with respect to Claim 1 and those claims that depend therefrom, there is no mention or suggestion, by the cited references, of selective precipitation of nanotubes by type. The failure of Smalley to disclose this feature is discussed in the Claim Rejection Under 35 U.S.C. § 102(a or e) above. Haddon fails to compensate for the deficiencies of Smalley. While Haddon discloses the separation of single walled carbon nanotubes from impurities (e.g., metal catalysts, nanoparticles, graphite, amorphous carbon, fullerenes, and other contaminants), Haddon does not disclose or suggest separation of the different types of single walled carbon nanotubes from each

other. In fact, Haddon focuses only on the solubilization of single walled carbon nanotubes in general, and fails to distinguish between the different types of single walled carbon nanotubes altogether. Thus, Haddon and Smalley, individually or in combination, fail to establish a *prima facie* case of obviousness against Claim 1 and those claims that depend therefrom.

Furthermore, with respect to Claim14, there is no disclosure or suggestion, by the cited art, of at least contacting a population of non-acid functionalized SWNTs with a surfactant amine. Smalley fails to disclose or suggest amines in the list of example surfactants provided in paragraph [0060]. In contrast to Smalley, Haddon does teach amine surfactants for functionalization of the nanotubes. However, Haddon requires acid functionalization prior to amine functionalization, which is directly opposite to the instantly claimed feature of contacting a population of **non-acid functionalized** SWNTs with a surfactant amine. Haddon and Smalley, either individually or in combination, therefore fail to establish a *prima facie* case of obviousness against Claim 14 and those claims that depend therefrom.

Accordingly, the Applicant respectfully requests withdrawal of the rejection to Claims 5-8 and 11-18.

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It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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